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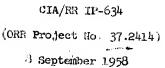
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ECONOMIC AND PRODUCTION IMPLICATIONS OF AN ASSUMED SOVIET GUIDED MISSILE PROGRAM
1954 to 1963

(ORR CONTRIBUTION TO THE AD HOC WORKING GROUP ON NESC REQUIREMENTS)





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FOREWORD

- 1. The purpose of this contribution is to assist the Ad Hoc Working Group on NESC Requirements in preparing a series of intelligence assumptions requested by the NESC. It presents economic and production implications of the assumed Soviet guided missile stockpile objectives supplied by the Ad Hoc Nuclear Delivery, and Air Defense Working Groups.
- 2. The paper presents an analysis of the general scope and character of Soviet economic activity required to implement a program of the magnitude and composition assumed. The analysis should be used in conjunction with other information, and in light of the competition for economic resources of other military and non-military programs, to judge whether the USSR is likely to carry out the guided missile program specified.
- 3. Because of time limitations, this contribution has not been coordinated with the Guided Missiles Intelligence Committee (GMIC), and reflects only the immediate views of the Office of Research and Reports. Its findings, therefore, should be considered preliminary. It is being disseminated in its present form in order to maximize its utility to the Ad Hoc Working Group.

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CONTENTS

	Page
Foreword	i
Table of Contents	ii
Findings	1
Discussion and Supplementary Data	7
Total Program Costs	7
Production Rates and Operational Stockpile	9
Selection of Costs	9
Appendixes	
A. Statistical Tables	11

MAJOR FINDINGS

- 1. The assumed program is very large and costly. While it is within Soviet gross economic capabilities, it nevertheless, is a program implying extremely high priorities for most of the systems, and a sense of urgency on the part of the USER to acquire substantial operational capabilities at the earliest possible dates. Some of the systems, in fact, require rates of production and expenditures so large as to very nearly conflict with the following governing assumptions of the over-all study:
 - (1) the USSE is not and will not during the period of this estimate be preparing for general war to begin at any particular date in the future; and
 - (2) all Soviet programs for production and operational deployment of guided missile systems during this period will be governed by considerations of optimum effectiveness vs. cost of weapons systems, maximum utilization of proven military hardware, minimum loss or wastage due to obsolescence factors, and maximum efficiency in the utilization of available resources.
- 2. The share of projected Soviet military expenditures required by the assumed program would grow to a level of about twenty percent of total expenditures by 1962*. Although the program implies an apparently reasonable share of projected Soviet military expenditures, (see Table 1) the procurement of missile system hardware would represent almost 40 percent of total military hardware procurement by 1960-1961. Missile system procurement in 1960-1961, for example, would almost equal total aircraft and naval vessel procurement combined.

The estimates of cost used in this analysis include only the costs which are directly incurred in the establishment and operation of the guided missile systems in the assumed program. They do not include the costs of research and development, warheads, the necessary but multi-purpose ground control intercept and carly warning radar systems, or the aircraft and naval vessels necessary to carry some of these missiles. They also specifically exclude costs incurred for space flight programs. If these excluded thems were taken into account, including the guided missile program's provata share of the cost of the multi-purpose items, the portion of Soviet multiary expenditures sttributable to guided missiles would, correspondingly, increase considerably over the twenty percent cited.

MARIE I

Comparison of Total Cost of Assumed Program and Projected Soviet Military Expenditure by Year, 1954-1962 (Billions of 1957 Dollars)

	1954	2.9 <u>55</u>	1956	<u> 1957</u>	1958	1959	<u> 1960</u>	1961	1962
USSR Military									
Expenditures	45.3	45.7	44.3	43.2	45.6	50.8	52.3	53.0	56.3
Assumed									
Frogram	0.4	0.8	1.1	1.0	2.1	5.5	9.2	10.4	10.8
Assumed Program as Percent of Military									
Expenditures	0.9	1.7	2.5	2.3	4.6	10.8	17.6	19.6	1.9.2

- 3. The total cost of the assumed program is divided almost equally between offensive and defensive missile systems. The high priority accorded the ICBM-IRBM systems is reflected by their accounting for almost one-third of the entire cost of the program. The ICBM program alone would account for almost one-quarter of the total program cost, and it is by far the largest single system in the program.
- 4. Although the ICBM stockpile requirement of 800 in the assumed program, is higher than the arbitrarily selected 500 ICBM figure used in NIE 11-5-58 as a basis for gauging Soviet capabilities, ICBM production rates in the assumed program are consistent with NIE 11-5-58, representing generally middle values within the ranges given in that estimate.
- 5. Approximately four-fifths of the 50 billion dollar total cost of the assumed program for 1954-1963 would fall in the last four years of the period. Investment and operating costs for the missile program would rise very sharply from about one billion dollars in 1956-1957 to more than 9 billion in 1960, with expenditures of from 10-11 billion dollars annually thereafter.
- 6. The extremely high peak production rate (8,500 missiles per month), and magnitude of economic resources (more than six billion dollars in four years), required to achieve the assumed deployment of the SA-3 low altitude defensive missile system by the time specified,

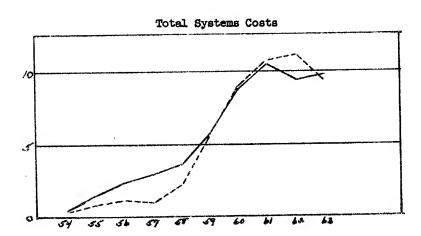
appear inconsistent with the governing assumptions of the study (paragraph 1, above). The Ad Hoc Working Group should review the priority likely to be accorded this program by the USSR in the light of probable Soviet views of Western low altitude attack capabilities, and reach a judgement as to modification, if any, of the SA-3 program as presented. To a lesser degree the same type of finding holds for the SA-2 system where a peak production rate of more than 5,000 missiles per month would be required to meet the stockpile objectives by the time specified.

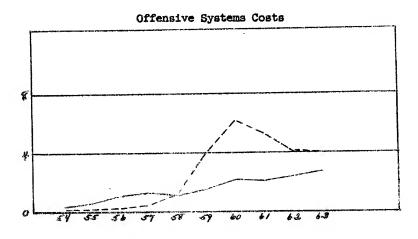
- 7. The SS-7 (200 n.m.) submarine conversion program appears questionable in the light of the discussion of operational capabilities contained in NIE 11-5-58. The estimate states that by 1958 the USSR would probably have converted only a few conventional submarines to guided missile employment, since the requirement for external stowage imposes rather severe limitations on speed, stability and maneuverability of the launching submarine. As a result, the assumed program shows only three submarines converted by the end of 1958. In the years 1958 through 1961, however in order to meet the stated requirement, this results in a conversion program of an admittedly inferior weapons system concurrently with the new production of superior guided missile submarines with internal stowage. It is suggested that the Ad Hoc Working Group reexamine the SS-7 conversion program requirement in order to determine whether increased new construction of the SS-7 weapon system submarine, which appears to offer a more reasonable solution, is possible.
- 8. The attention of the Ad Hoc Working Group is called to the production scheduling and cost implications of the 100 n.m. through 750 n.m. range ballistic missiles (SS-1 through SS-4) Although radar track/radio command guidance versions of these missile systems are estimated in NIE 11-5-58 to be available for operational use very early in the period (1954-1956), each is also estimated to be improvable to an all-inertial guidance system by 1959. In order to minimize wastage due to obsolescence factors, the production schedules used in the assumed program for these systems were held at somewhat depressed rates until the all-inertial systems became available. This had two effects: (1) the number of operational missiles available by 1958 was considerably smaller than would have been the case otherwise; and (2) while reducing

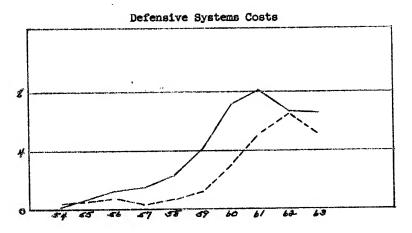
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TABLE II

Comparisons of Costs of NIE 11-5-57 and Assumed Program by Year, 1954-1963 (Billions of 1957 Dollars)







NIE 11-5-57

---- Assumed Programs

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over-all costs, this tended to accentuate slightly the already high costs of the total missile program in the years 1960-1961. The Ad Hoc Working Group should review the relative advantages of the all-inertial systems and judge whether the USSR would be likely to await their availability before acquiring the stockpiles specified.

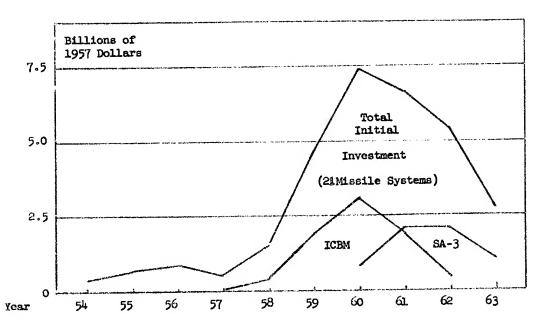
- 9. As shown in Table II, the total cost of the assumed program is of the same magnitude as that presented in Annex A of NIE 11-5-57, if prices, and the period covered, are adjusted for comparability. The principal differences in the curves of total costs are that while the assumed program initially builds up more slowly, it then increases more rapidly in the 1958-1960 period, revealing a slightly higher and more even peak than NIE 11-5-57. The internal composition of the costs of the two programs, however, reveal significant differences, as shown on the sub-tables comparing costs of offensive and defensive systems. Whereas offensive missile systems accounted for only thirty percent of the total costs in the NIE, they account for approximately half in the present study. The higher cost of offensive missile systems in the assumed program stems principally from changes in the ICBM and IRBM systems. In the present study, parameters relating to higher rates of fire and reduced vulnerability result in considerably higher costs than the minimum ICBM and IRBM systems included in the NIE. In contrast to the offensive systems, the cost of defensive missile systems in the assumed program represents a sizeable reduction compared to the NIE program.
- 10. The ICEM and the low altitude surface-to-air systems are clearly the two highest priority systems in the assumed program, with their combined investment costs representing about 45 percent of the total initial investment in the program. (See Table III)

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TABLE III

Selected Initial Investment Costs of Assumed
Program by Year, 1954-1963



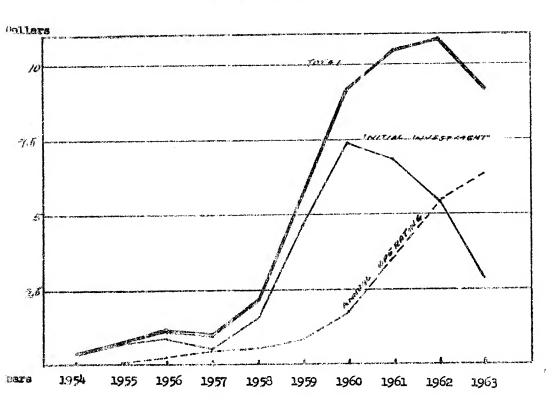
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DISCUSSION AND SUPPLEMENTARY PARTY

Total Program Costs

1. Table IV shows the level of expenditures for initial investment and operating costs* in the assumed program, by year, well as total costs.

Yearly Cost of the Assumed Program, 1954-1963
(billions of 1957 Dollars)



^{*} See Appendix A for detailed statistical tables relating to the Assumed Program.

In calculating the costs of the assumed program a clear distinction has been made between two basic types of costs: initial investment cost, and annual operating cost. Initial investment costs are those one time costs involved in establishing and activating the cystem. Annual operating costs are the additional recurring expenses which result from the operation and maintenance of equipment and personnel initially procured and paid for under investment costs.

- 2. As shown in Table IV, the total cost of the program increases very sharply from 1958 to 1960, with costs in 1960 being more than four times 1958. This sharp rise is caused in part by the fact that eight new Soviet missile systems are estimated to become initially available for operational use during this three-year period, with a resultant heavy increase in the costs required to produce and deploy these systems in quantity. The implied rate of increase in the total cost of the missile program, however, is somewhat misleading unless it is remembered that the cost of research and development has not been included. It is clear from the large number of systems which become available in this compressed time period, that the costs of development incurred in the years immediately preceding would be quite large, and could be as high as several billion dollars per year. While developmental costs would continue throughout the period, they would decline sharply as a percentage of total Soviet guided missile program costs compared to the earlier period.
- 3. Table V presents a summary of the total costs of the assumed missile program by category of missiles.

Table V

Total Costs of Assumed Missile Program
By Category of Missiles
(Billions of 1957 Dollars)

	Initial Investment	Operating Costs	Total.	Percent of Total
Surface-to-Air,	aritus vilanditus vas Amerika estano atenzinteleja, ys. majaju je	ant his a Digwale - and gardine his managemen		antikantika ertiki (ilike) (iliye mengende iliyen gilakiyan adalilik de s
Ground-Launched	12.3	6.4	18.7	37.0
Surface-to-Air,				
Ship-Launched	1.2	~3	1.5	3.0
lir-to-Air	2.4	1.7	4.1	8.3
lir-to-Surface	.2	2،	.4	.8
Surface-to-Surface,				
(up to and including 700 n.m.)	3.8	4.5	8.3	16.4
Surface-to-Surface,				
Submarine-Launched	1.4	.2	1.6	3.2
RBM (1,100 n.m.)	2.0	1.6	3.6	7.1
(CBM (5,500 n.m.)	7.9	4.3	12.2	24.2
TOTAL	31.2	19.3	50.5	1.00.0

h. Although variations in total cost between missile systems in Table V generally reflects the higher costs of those systems, it also results from other factors such as size of stockpile, number of years operational, and system elements costed. In the latter instance, for example, the costs of systems such as the Air-to-Air, Air-to-Surface, Maval Launched, Surface-to-Air, and part of the Surface-to-Surface Laval, understate true total costs somewhat, in that they do not include the missile program's pro rate share of the multi-purpose items such as aircraft, and naval vessels which are in fact intrinsic parts of the wespons systems.

Production Rates and Operational Stockpile

5. The Operational Stockpile for each of the twenty-one missile systems in the Assumed Program was based upon the summary of numbers a and systems criteria proposed by the Ad Hoc Nuclear Delivery and Air Defense Working Groups. The total missile production required to meet each of these assumed Soviet stockpile objectives, was derived by including not only the stockpile numbers but also by accounting for miditional missile requirements such as pipeline, training, maintenance, and other logistic attrition. The systems were scheduled with peak rates and time at peak production refrecting the most economic programming and the cost effectiveness of the weapons system relative to successor programs and requirement time. The date of initiation of production of operational missiles, in all cases, was selected as the mid-point of the year or years given in NIE 11-5-58 as the probable first operational capability date. Allowances for build-up and lead times consistent with U.S. industrial experience were used throughout the program. Unit activation and deployment occurred as the missiles and system elements became available.

Selection of Costs

6. The costs of the assumed program were calculated in 1957 dollars in order to illustrate, in convenient terms, the general magnitude and composition of the program. The dollar costs assigned each system were derived generally by adjusting available cost data for U.S. systems with similar characteristics to those estimated for the Soviet program

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in NIE 11-5-58. The techniques and methods used in the cost analysis are those well established in U.S. military weapons systems cost analysis practice, and although average unit costs were used throughout, for convenience, the unit costs selected took into account the reduction in costs which occur as the volume of production increases.

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APPENDIX A

STATISTICAL TABLES

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Number of Guided Missiles In Operational Stockpile, by Year, 1954-1963 (Numbers of Missiles, Cumulative at end of Year)

NIE 11-5-58 Designation	Stockpile Objective	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	erdandyski, SS
Surface-to-Surface-Ballist SS-1 (100 n.m.) SS-2 (200 n.m.) SS-3 (350 n.m.) SS-4 (700 n.m.) SS-5 (1,100 n.m.) SS-6 (ICBM)	3,000 1,500 750 350 350 800	100 40 30	200 150 100	450 300 150 10	850 450 200 30	1,250 600 250 70 10	2,000 1,050 450 190 80 20	2,750 1,500 650 310 190 260	3,000 1,500 750 350 300 630	3,000 1,500 750 350 350 800	3,000 1,500 750 350 350 800	(
Surface-to-Surface-Naval SS-7 (200 n.m. Sub) SS-8 (100 n.m. Sub)	240 200			4	10	20	60	140	240	240 20	240 90	
Air-to-Surface AS-1 (55 n.m.) AS-2 (100 n.m.)	300 200				75	200	300	300	300 65	300 200	300 200	(
Air-to-Air AA-1 AA-2 AA-3 AA-4 (A & B) AA-4 (C)	3,800 3,800 23,500 24,000 10,000			1,000 1,000	2,900 2,900	3,800 3,800 2,900	3,800 3,800 13,100	3,600 3,600 23,500 1,400	1,600 1,600 23,500 8,500	17,600 18,400	5,600 24,000 2,000	

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Number of Guided Missiles In Operational Stockpile, by Year, 1954-1963 (Numbers of Missiles, Cumulative at end of Year) (Continued)

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NTE 11-		Stockpile Objecti v e	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963
Surface	-to-Air-Ground Lau	nched										
SA-1 SA-2 SA-3 SA-4	(Moscow Sites) (Moscow Sites) (All Other)	13,400 13,400 23,000 77,000 14,000	2,640	7,900	13,400	12,900 500 130	8,600 4,800 2,200	2,600 10,800 5,400	13,400 10,000 10,000 3,000	13,400 18,000 36,000 10,000	13,400 23,000 63,000 14,000	13,400 23,000 77,00 0 14,000
Surface	-to-Air-Naval Laun	ched										
8A-6 SA-7	(Naval) (Naval)	500 1,300						200	500	500 200	500 800	500 1,300

Approved For Release 2001/11/20: CIA-RDP79R00961A000900070007-5 Number of Operational Units Deployed and Equipped with Missiles, by Year, 1954-1963 (Number of Units, Cumulative at end of Year)

NIE 11-5-58 Designation	1954	1955	1956	1957	1.958	1959	1960	1961	1962	1963 .
Surface-to-Surface-Ballistic										,
SS-1 (100 n.m.) SS-2 (200 n.m.) SS-3 (350 n.m.) SS-4 (700 n.m.) SS-5 (1,100 n.m.) SS-6 (ICEM)	1 1 1	4 3 2	9 6 3 1	17 9 4 3	25 12 5 7 2	40 21 9 19 11 3	55 30 13 31 23 33	60 30 15 35 32 70	60 30 15 35 35 80	60 30 15 35 35 80
Surface-to-Surface-Naval										
SS-7 (200 n.m. Sub) SS-8 (1,000 n.m. Sub)			1	2	14	10	25	40	40 1	40 5
Air-to-Surface										•
AS-1 (55 n.m.) AS-2 (100 n.m.)				15	45	60	60	60 13	60 40	60 40 ∢
Air-to-Air										
AA-1 AA-2 AA-3 AA-4 (A & B) AA-4 (C)			120 120	360 360	480 480 361	480 480 1,639	450 450 2,943 176	200 200 2,943 1,059	2,206 2,194	700 3,000 800

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Number of Operational Units Deployed and Equipped with Missiles, by Year, 1954-1963 (Number of Units, Cumulative at end of Year) (Continued)

NIE 11-5-58 Designation	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963
Surface-to-Air-Ground Launch	hed									
SA-1 SA-2 SA-3 SA-4 SA-5 (Anti-ICBM)*	11	33	56	56 1	56 17	56 41	56 88 20	56 127 71 25	56 175 123 75	56 175 150 100
Surface-to-Air-Naval Launche	ed.									
SA-6 Destroyers Cruisers SA-7 Destroyers						1	<u>4</u> 2	<u>4</u> 2	ķ 2	4 2
Cruisers								2 1	7 3	13 4

^{*} Not available in the time period.

Approved For Release 2001/11/20: CIA-RDP79R00961A000900070007-5 Summary of Defensive Missile Production and Units Deployed by Missile and Year, 1954-1963

NIE 11-5-58 Designation	-	Monthly Missile Production At Peak Rate	No. of Mos. At Peak Rate	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	Totals
AA-1	Missiles Produced Aircraft Deployed	1,680	18			1,680 120	3,360 240	1,680 120						6,720 480
A A- 2	Missiles Produced Aircraft Deployed	1,680	18			1,680 120	3,360 240	1,680						6,720
AA-3	Missiles Produced Aircraft Deployed	1,150	18					3,690 361	13,840 1,278	13,744 1,304				31,274 2,943
AA-4 (A & B)	Missiles Produced Aircraft Deployed	1,325	25							2,464 176	10,362 883	15,890 1,135	9,800 806	38,516 3,000
AA-4 (C)	Missiles Produced Aircraft Deployed	NA#	NA*										2,000 800	NA**
5A-1	Missiles Produced Units Deployed	1,736	24	3,472 11	6,944 22	6,944 23								17,360 56
5A-2	Missiles Produced** Units Deployed	5,372	45				1,074	8,326 16	10,743 24	10,743 47	10,742 39	5,372 48		47,000 175
SA-3	Missiles Produced Units Deployed	8,548	27							13,677 20	33,337 51	34,193 52	17,097 27	98,304 150
5A-4	Missiles Produced Units Deployed	7 25	18								4,352 25	8,704 50	4,352 25	17,408 100
A-6 (Naval)	Missiles Produced Destroyers Deployed Cruisers Deployed	25-30	12	•					250 1 1	350 3 1		·		600 4 2
BA-7 (Naval)	Missiles Produced Destroyers Deployed Cruisers Deployed	50	2l _t								300 2 1	600 5 2	600 6 1	1,500 13

^{*} Based on availability 6 months production of buildup. Aircraft production schedule production includes 17,300 missiles for indeterminate.

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Approved For Release 2001/11/20: CIA-RDP79R00961A000900070007-5 Summary of Offensive Missile Production and Units Deployed by Missile and Year, 1954-1963

NIZ 11-5-58 Designation		Monthly Missile Production At Peak Rate	No. of Mos. At Peak Rate	1954	1955	1956	1957	1953	1959	1960	1961	1962	1963	Totals
SS-1 (100 n.m.)	Missiles Produced Units Deployed	75	42	112 1	288 3	400 5	500 8	500 8	700 15#	700 15	400 5			3,600 60
SS-2 (200 n.m.)	Missiles Produced Units Deployed	33	48	50 1	150 2	200 3	200 3	200 3	500 * 9	500 9				1,800 30
SS-3 (350 n.m.)	Missiles Produced Units Deployed	31	36	32 1	68 1	75 1	75 1	75 1	225 4*	225 4	125 2			900 15
SS-4 (700 n.m.)	Missiles Produced Units Deployed	11	33			12 1	35 2	70 4	130 12*	1.30 1.2	60 4			437 35
SS-5 (1,100 n.m.)	Missiles Produced Units Deployed	11	33					24 2	105 9*	132 12	121 9	55 3		437 35
ss-6 (ICBM)	Missiles Produced Units Deployed	36	23						50 3	360 30	396 37	161 10*		967 80
SS-7 (200 n.m. Sub.)	Missiles Produced Converted Submarines New Submarines	10	42			10 1	10 1	25 1 1	75 3 3	190 7 8	190 7 8			500 20 20
SS-8 (1,000 n.m. Sub.)	Missiles Produced Submarines Deployed	6-7	12**									30 1	80 4	110** 5**
AS-1 (55 n.m.)	Missiles Produced Aircraft Deployed	17	18				100 15	200 30	100 15					400 60
AS-2 (100 n.m.)	Missiles Produced Aircraft Deployed	17	12								100 13	200 27		300 40

Change from radar track/radio command to all-inertial system.

^{**} Based on 10 submarine (nuclear) program completed in 1964. 24 months at peak rate.

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TABLE V-A
TREAMING CORES OF ABRUMBED PROGRESS 1954-1963
(Billions of 1957 Dollard)

gazzeta zi e e e e e e e e e e e e e e e e e e	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	Total
Initial Investment	.4	.7	•9	٠ 5 `	1.5	4.6	7.4	6.9	5.4	2.9	31.2
Annual Operating		.1	.2	.4	.6	۰9	1.8	3.6	5.4	6.3	19.3
Total	.4	.8	1,1	۰9	2.1	5.5	9.2	10.5	10.8	9.2	50.5

TABLE VI-A

Total Investment and Operating Costs of
Assumed Program by, Missile System

	Investme	nt Costs	Operatin	g Costs	Total	Costs
NIE 11-5-58 Designation	Billions 1957 Dollars	Percent of Total	Billions 1957 Dollars	Percent of Total	Billions 1957 Dollars	Percent of Total
SS-1 SS-2 SS-3 SS-4 SS-5 SS-6 SS-7 SS-8	1.1 0.7 0.4 1.5 1.9 7.9 0.9	3.5 2.2 1.3 4.8 6.1 25.3 2.9	0.8 0.6 0.7 2.5 1.6 4.3 0.1 0.1	4.1 3.1 3.6 13.0 8.4 22.3 0.5	1.9 1.3 1.1 4.0 3.5 12.2 1.0	3.7 2.7 2.2 7.9 6.9 24.2 2.0
AS-1 AS-2	0.1 0.1	0.3 0.3	0.2	1.0	0.3	0.6 0.2
AA-1 AA-2 AA-3 AA-4 (A & B) RA-4 (C)	0.2 * 1.1 1.0 0.2	0.6 3.5 3.2 0.6	0.1 0.1 1.4 0.1	0.5 0.5 7.3 0.5	0.3 0.1 2.5 1.1 0.2	0.6 0.2 4.9 2.2 0.4
SA-1 SA-2 SA-3 GA-4 SA-6 SA-7	1.4 2.6 6.1 2.2 0.2 1.0	4.4 8.3 19.5 7.5 0.6 3.2	2.6 1.8 1.5 0.5 0.2 0.1	13.5 9.3 7.8 2.6 1.0	4.0 4.4 7.6 2.7 0.4 1.1	7.9 8.7 15.0 5.3 0.8 2.2
TOTAL	32	100.0	19.3	100.0	50.5	100.0

^{*} Less than 50 million dollars.